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CDC's National Environmental Public Health Tracking Program in Action: Case Studies From State and Local Health Departments

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Abstract

The Centers for Disease Control and Prevention's (CDC's) National Environmental Public Health Tracking Program (Tracking Program) is a multidisciplinary collaboration that involves the ongoing collection, integration, analysis, interpretation, and dissemination of data from environmental hazard monitoring, human exposure surveillance, and health effects surveillance. With a renewed focus on data-driven decision-making, the CDC's Tracking Program emphasizes dissemination of actionable data to public health practitioners, policy makers, and communities. The CDC's National Environmental Public Health Tracking Network (Tracking Network), a Web-based system with components at the national, state, and local levels, houses environmental public health data used to inform public health actions (PHAs) to improve community health. This article serves as a detailed landscape on the Tracking Program and Tracking Network and the Tracking Program's leading performance measure, "public health actions." Tracking PHAs are qualitative statements addressing a local problem or situation, the role of the state or local Tracking Program, how the problem or situation was addressed, and the action taken. More than 400 PHAs have been reported by funded state and local health departments since the Tracking Program began collecting PHAs in 2005. Three case studies are provided to illustrate the use of the Tracking Program resources and data on the Tracking Network, and the diversity of actions taken. Through a collaborative network of experts, data, and tools, the Tracking Program and its Tracking Network are actively informing state and local PHAs. In a time of competing priorities and limited funding, PHAs can serve as a powerful tool to advance environmental public health practice.

Keywords

environmental monitoring; environmental public health action; environmental public health surveillance; environmental surveillance; public health action; state and local health departments; surveillance system; tracking

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More than 15 years ago, the Pew Environmental Health Commission urged national leaders to strengthen the nation's public health defense against environmental threats.[1] In response to the Pew report, the United States Congress appropriated funds to the Centers for Disease Control and Prevention (CDC) to begin development of the National Environmental Public Health Tracking Network (Tracking Network), linking information on environmentally related diseases, human exposures, and environmental hazards.[2] Since 2002, the CDC has engaged stakeholders from universities, not-for-profit organizations, and local, state, and other federal health and environmental agencies to aid in shaping and refining the network. In 2009, the CDC's National Environmental Public Health Tracking Program (Tracking Program) launched the Tracking Network, becoming the first surveillance system to offer environmental data and public health data in a single, integrated repository.[3] The CDC's Tracking Network, a distinct product of the CDC's National Tracking Program, is a multitiered, online surveillance system with components at the local, state, and federal levels. Currently, the CDC's Tracking Program funds health departments in 25 states and New York City (referred to as grantees) to build and maintain local Tracking programs and networks.

The Tracking Network includes a core set of nationally consistent data and measures (NCDM) composed of health, environmental exposures, and environmental hazards data.[4] NCDM are developed through a collaborative workgroup of experts including partners, grantees, and data stewards called the Content Workgroup (CWG) and are adopted by the CDC as Tracking Network standards. The CWG identifies key environmental public health data needs and evaluates available data to determine whether they are of sufficient quality and completeness to address the identified need and appropriateness for environmental public health tracking. NCDM and other environmental health measures are generated from data provided by grantees or by national partners, are standardized and validated by the CDC, and are disseminated through the National Tracking Network. Grantees provide NCDM and additional data and measures on their state and local Tracking networks to address state and local needs.

The Pew report outlined the need not only for a comprehensive nationwide network of data but also for a skilled workforce able to collect, analyze, and interpret data, translate information for health action, and provide response capacity to defend against health threats.[1,3] In a 1998 report of public health surveillance, Thacker and Berkelman indicated, "No public health surveillance system is complete without being linked to action."[5](p174) Recognizing the importance of skilled workforce and actionable data, the Tracking Program addresses health surveillance needs by building on the network of people (individual and organizational expertise) and the network of information (the national and local Tracking networks and data). The Tracking Network is designed to meet the needs of a diverse group of users who often have different knowledge and skill sets related to data use. Users benefit from the Tracking Program's various tools and features, including training products, which allows for a better understanding of the available data and their use. These support mechanisms are a critical component of the Tracking Network because it also ensures the quality of a well-trained public health workforce.

The existence and availability of robust, wide-ranging data speak to the advances made in the technology and science fields that the Tracking Network aims to capture. However, it is the application of data that remains essential: taking educated action promotes healthy, informed communities. By empowering environmental and public health practitioners, health providers, community members, policy makers, and the greater public to make evidence-based health decisions, the Tracking Program is closer to its vision of healthy and informed communities. See Figure 1 for a conceptual diagram of the Tracking Network's framework.

Tracking Program's Public Health Actions

The mission of the Tracking Program is "to provide information from a nationwide network of integrated health and environmental data that drives actions to improve the health of communities."[6] In 2005, the CDC began monitoring the Tracking Program's progress and performance in meeting this mission by gathering information on how its Tracking Network, workforce, and other resources have been used to drive public health actions (PHAs) within individually funded Tracking programs.[7] One year later, the Tracking Program published a formal performance measurement plan that served as the management companion to the Tracking Program's strategic plan for fiscal years 2005 through 2010 and included information on grantee PHAs.[8] The establishment of performance standards guides state and local Tracking efforts and provides data to evaluate progress made toward goals outlined in the strategic plan. The Tracking Program's performance measurement process involves many stakeholders who contribute to the data collection and evaluation steps. Tracking Program grantees report PHAs to the CDC and provide information on the local problem or situation, the role of the grantee Tracking Program, how the problem or situation was addressed, and the action taken. From 2005 to 2016, more than 400 PHAs have been accepted by the CDC.

The CDC's Tracking Program defines a PHA based on traditional uses of surveillance data to include activities that impact any of the following components[9]:

- Identifying populations at risk of environmentally related diseases or of exposure to hazards;
- Responding to outbreaks, disease clusters, and emerging threats;
- Establishing the relationship between environmental hazards and disease (hypothesis generating);
- Guiding intervention strategies to prevent disease, disability, and injury;
- Identifying, reducing, and preventing harmful environmental risks on human health;
- Advancing the public health basis for policy making;
- Informing the public about health and the environment; and
- Informing legislators, policy makers, communities, and individuals regarding potential environmental health risks.[8]

To capture meaningful and actionable programmatic data, the Tracking Program has worked to streamline the PHA process and address issues identified in the March/April 2015 *Journal of Public Health Management & Practice* article, "Data to Action: Using Environmental Public Health Tracking to Inform Decision Making."[10] The authors found several limitations to the PHA use assessment they conducted. They found that approximately 70% of all activities reported to the CDC met the PHA criteria set by the CDC's Tracking Program. The article estimated that up to 40% of other activities reported would meet the definition of a PHA if additional follow-up was conducted on behalf of the Tracking Program. The authors also noted the varied quality of reporting for each PHA across grantees and years may have affected their analysis. Grantees submit activities to the CDC (in the form of annual and quarterly reports) to demonstrate the success of their program.

On the basis of these findings, the Tracking Program refined and clarified guidance and technical support to grantees to improve the PHA process. Currently, grantees are required to report PHAs on a quarterly basis. They are asked to report on interventions and programmatic activities that drive PHAs and demonstrate public health impact. As a result, grantees provide a qualitative statement of the PHA that includes a unique title, identification of the problem or situation, description of their Tracking Program's involvement, the action taken, and the impact of their resulting action in addressing the problem or situation. If feasible, they are also asked to quantify the impact of the resulting action on the health of the population affected.[11] Because this information is collected quarterly, it helps provide timely information to the CDC on state and local health departments' challenges and priorities.

Grantees have been supportive in providing additional detail to the Tracking Program on their submitted PHAs. Following the quarterly PHA submission, the Tracking Program works closely with the grantee to provide feedback. The Tracking Program is able to capture programmatic data in a more consistent and standardized fashion while still recognizing the need for ongoing process evaluation. PHAs are one of the leading performance measures reported by grantees and are frequently used to demonstrate national program value and effectiveness. The Tracking Program continually strives to improve its performance measurement reporting process and works closely with its grantees to ensure that process monitoring and accountability are conducted in a thoughtful manner.

The purpose of this article was to provide an updated examination on the different types of PHAs Tracking grantees have shared with the CDC's Tracking Program. The article offers a broad overview on the scope of PHAs the CDC accepts, showcasing the utility and impact of Tracking in state and local environmental public health practice. There are numerous PHAs using Tracking data at the state and local levels, including actions related to policy or program changes, interventions targeted to at-risk populations, implementation or revision of environmental health regulations, and scientifically based responses to community health concerns. The scope and scale of Tracking Program PHAs continue to grow in response to the public health needs of each distinct community.

Methods

We selected 3 PHAs as case studies to illustrate the use and impact of the state and local Tracking programs. More specifically, the PHAs selected to highlight diversity in the overall action, the role of the grantee Tracking Program, the environmental issue, health outcome(s), and how the PHA was initiated. These case studies are only a few examples of the public health problems, priorities, and needs that state and local health departments encounter in their daily responsibilities. Concentrating only on fiscal years (FY) 2015 and 2016, we selected 2 actions from FY 2015, Utah Tracking Program and Kentucky Tracking Program, and 1 action from FY 2016, Florida Tracking Program.

CDC Tracking grantees also vary in length of time funded and funding amount; however, all funded grantees are still required to submit PHAs by the CDC. Some grantees, such as the Kentucky Tracking Program, are in the implementation phase with the focus on capacity building and implementation of their state-specific Tracking networks. Successfully completing this work is a prerequisite for moving into the next phase of network maintenance and growth. Typically, grantees that have been funded by the CDC for more than 3 years, such as the Florida Tracking Program and the Utah Tracking Program, are in the network maintenance and enhancement phase. These programs have developed and implemented a standards-based Tracking Network and built program capacity (Figure 2).

Case Studies

Utah Tracking recommends inclusion of radon data on certified home buying resource

The first case study examines a PHA originally submitted in FY 2015 by the Utah Environmental Public Health Tracking Network (also referred as “Utah Tracking Program”). Of Utah’s 29 counties, the Environmental Protection Agency (EPA) has classified 7 counties with the highest potential for predicted average indoor radon screening levels and the remaining 22 counties with a moderate potential for radon levels.[12] The Utah Tracking Program identified a problem concerning radon exposure and wanted to encourage home testing for Utah citizens. The program stated,

> Awareness of radon as a preventable health hazard is growing in Utah. This [awareness] is occurring not just among citizens, but with state legislators as well. Due to this increased awareness, multiple legislative bills involving radon have been proposed before the Utah State Legislature.[13]

The Utah Tracking Program has played a key role in radon awareness efforts in Utah. These efforts include conducting radon education and outreach activities to the general public and providing radon data on the Utah Tracking Program Web site. Utah’s radon data have been used in all radon outreach efforts as part of radon awareness messaging. The Utah Tracking Program also participates in a radon awareness committee composed of state and local environmental and public health professionals, community organizations, and nonprofit organizations. This cumulative effect of radon outreach activities has brought increased public attention to radon.

This increased awareness played an important role in galvanizing state representatives to propose a legislative bill requiring radon testing for all home transactions. While the Utah Association of Realtors was not in favor of the legislation, it did agree to modify the *Utah Buyer Due Diligence Checklist* and include radon as a dedicated item. The checklist is a legally binding document provided by real estate agents to the potential buyers during a new home purchase. Potential buyers use the checklist to evaluate the physical condition and safety of a property before purchase. Each item on the checklist must be signed and acknowledged by the potential buyer as part of the transaction. Previously, radon was included in a nonexhaustive list of various home hazards. The new checklist item explains the health hazard of radon and provides resources on where to find more radon-related information, including mitigation services. Because radon is now included as a dedicated item on the checklist, potential home buyers are mindful of their own radon exposure, which helps increase awareness and responsibility to test their homes for radon.

Also in 2015, Utah's Tracking Program staff attended a "Maps on the Hill" event, which showcased the utility of mapping technology to members of the Utah Legislature and the general public that helped raise awareness about radon. The Utah Tracking Program showcased Tracking data to highlight areas of Utah that potentially had a higher risk of radon-related lung cancer. They also contributed to a white paper that was used to inform policy makers about radon during the 2015 Utah Legislative Session. In that paper, they generated estimates of the economic burden of radon-related lung cancers for the state; specifically, they estimated it could cost Utah residents between $2.7 million and $3 million, in the first year alone, for medical treatment related to radon exposure. This information and other collaborative efforts helped lead an increase in funding for radon awareness efforts in 2016.[14]

Kentucky Tracking analyzes cancer data to address community concerns at landfill site

The second case study examines a PHA originally submitted in FY 2015 by the Kentucky Tracking Program. A former resident of a Louisville community near Lee's Lane Landfill, a documented EPA Super-fund site,[15] contacted the Agency for Toxic Substances and Disease Registry (ATSDR) to express concerns about continuing exposure to chemical hazards due to the landfill and its impact on the health of current and former area residents. ATSDR communicated these concerns to the Kentucky Tracking Program and requested technical assistance on investigating a possible cancer cluster in this area.

Following CDC guidelines,[16] the Kentucky Tracking Program assessed whether a statistically significant cancer cluster existed. Working with the Kentucky Cancer Registry, the Kentucky Tracking Program identified bladder, brain, esophageal, kidney, larynx, liver, leukemia, and non–Hodgkin lymphoma cancer data as potential outcomes of the exposure to chemicals in the landfill. Data on these environmentally related cancers were used to determine whether the number of reported cases in the Lee's Lane zip code was an excess of cancer incidence or mortality in the area. Information on air toxins such as benzene and formaldehyde was also reviewed, as well as population and socioeconomic data.

After a thorough analysis, the Kentucky Tracking Program did not conclusively determine risks of cancer or overall mortality to the Lee's Lane residents.[17] However, important

observations were noted, including higher-than-expected numbers of individual cancer types for the period analyzed. A response letter with results of this analysis and recommendations for continued environmental monitoring and epidemiologic study was sent to the concerned citizen. As a result of Kentucky Tracking Program's cancer study and its collaboration with the local health department, the Kentucky Cancer Registry, and the University of Louisville, standardized program policies have developed to address reports of noninfectious disease clustering. The Kentucky Tracking Program's study prompted the establishment of a formalized program process as well as identification of appropriate expertise and resources (including the Kentucky Tracking Program). In turn, the process and resources needed to review a potential cluster are now streamlined and the agencies involved are better equipped to respond to future requests.

As a result of this analysis, another important action resulted. A formalized community health assessment (CHA) has begun for the neighborhood of Riverside Gardens, located in the underserved, southwest section of Louisville adjacent to the Lee's Lane Landfill. This CHA, led by the University of Louisville, is the first in-depth health assessment of the Riverside Gardens residents. The project has already utilized some Kentucky Tracking data and expertise to compare rates of cancer in Riverside Gardens residents with rates of cancer in similar populations. The Kentucky Tracking Program, part of a steering committee for this project, has helped guide recommendations for the Riverside Gardens CHA. Today, Lee's Lane continues to be monitored by the Louisville Metro Sewer District and EPA.[17]

Florida Tracking and mapping demographic variables for Zika virus

Initially reported in FY 2016, the Florida Tracking Program submitted a PHA on mapping demographic variables for Zika virus disease surveillance. Florida reported its first CDC-confirmed travel-related Zika virus–infected case at the end of January 2016. At this time, Florida was also the only state with local Zika virus transmission in Miami-Dade County. Recognizing the importance of understanding the epidemiology of Zika virus infection, the Florida Department of Health became very interested in mapping demographic characteristics of communities with Zika virus–infected cases based on lessons learned from dengue and other arbovirus outbreaks to better target prevention and control efforts for mosquitos. Because of the Florida Tracking Program's expertise in mapping demographic characteristics related to disease outbreaks and population vulnerability, the program was tasked with mapping these data. The Florida Tracking Program identified 4 variables from the American Community Survey that could inform these efforts: percent population below poverty line, percent nonwhite, percentage of women of childbearing age, and percent speaking a language other than English at home. Using ArcGIS software, the Florida Tracking Program mapped these variables at the census tract level for all counties in Florida that had any Zika virus–infected cases (including travel-associated cases). Knowing that the mosquito-borne virus can spread very quickly, the Florida Tracking Program leveraged its expertise and technical infrastructure and made the geographical information systems (GIS) tool available online within 24 hours of the initial request from the Florida Department of Health.

The Florida Tracking Program described the importance of its tool:

> In the case of the Zika virus, understanding the population distribution of women of child-bearing age (who may become pregnant) is very important. In addition, previous studies on dengue showed that very concentrated, local efforts are necessary to control *Aedes* species mosquitos in vulnerable populations. Since such intervention efforts are very labor intensive, it is important to understand where health department efforts are most needed to reach vulnerable populations and reduce the likelihood of human cases of Zika.[18]

Currently, the Florida Tracking Program's mapping tool is available to all Florida county health departments. As of May 2017, more than half of Florida's 67 counties are still under a public health advisory for Zika virus disease. This tool has been utilized by both the Florida Department of Health's Central Incident Command Center and local health departments in Florida since it was first made available online in February 2016. Florida Tracking Program's mapping tool allowed vector-borne disease experts to better pinpoint active transmission zones in Miami-Dade County. With more than 200 locally acquired cases to track in this area as well as more than 13 000 screenings conducted in 2016, the Florida Tracking mapping tool was helpful in providing timely and relevant data to assist with decision making. The Florida Tracking Program also partnered with the Louisiana Tracking Program to help adapt the Zika virus mapping tool to their local parishes. Using Florida Tracking methodology and lessons learned, the Louisiana Tracking Program is now developing its state-specific GIS mapping tool. The Florida Tracking Program continues to update its mapping tool to include the availability of risk maps and screening data, which help public health decision makers address recommendations on prioritization of interventions as well as identification of areas of risk for vulnerable populations.

Discussion

The Tracking Program grantees featured in this article employed a multilayered approach to address significant public health issues in their communities. Each grantee used a combination of data, technical infrastructure, and workforce capacity within their Tracking Program to help address the public health issue at hand (Table). The Tracking Program grantees fostered collaboration and facilitated public health outcomes through program activities.

For example, the Florida Tracking Program was identified as an expert for mapping demographic variables. Changes in interactions between people, animals, insects, and the environment can lead to new diseases emerging and reemerging (eg, Zika virus disease).[19] Florida Tracking's expertise on this subject matter was crucial, especially during an active environmental public health emergency such as Zika virus disease. In this situation, Florida Tracking's expertise was used to identify vulnerable populations whose health conditions may worsen because of exposure to environmental hazards. As a result of Florida Tracking's resources and expertise, communities and policy makers were able to make informed decisions to respond to the public health threat of Zika virus disease. The Louisiana Tracking Program was also able to apply similar methodologies, lessons learned, and expertise from its Tracking neighbor and create tailored interventions addressing public health threats in that state.

An excellent example of an action involving public health policy and practice is Utah Tracking's PHA concerning radon exposure in Utah homes. The Utah Tracking Program was able to highlight an important environmental hazard, which was then included in a prominent, legally binding home buying resource. In addition, its participation in a state policy and mapping event paired with its contribution to a white paper played a role in increased funding for radon education and awareness activities around the state. This achievement by Utah Tracking not only demonstrates a policy action based on environmental data but also helps develop an increased awareness of indoor radon exposure among Utah's residents, especially those who use the document for home purchases. Environment and public health information from the Utah Tracking Program equally educates the greater public and informs future public health interventions.

Responding to concerns about cancer or other disease clusters is a common responsibility of state and local health departments. Using the resources of their Tracking Network, grantees are also able to directly respond to community cancer cluster concerns in a systematic and timely manner. In Kentucky Tracking's case study, Kentucky Tracking staff utilized their existing expertise and data and were able to rapidly respond to a citizen's concerns and make a professional public health judgment call. This is also important to note because only a small fraction of cancer cluster inquiries meet the necessary criteria to support a full-scale cancer cluster investigation.[20] As a result of Kentucky Tracking's efforts, programmatic policies are being put into place at the state and local levels to address future reports of noninfectious disease clustering. Their analysis also prompted a systematic examination of health indicators for an underserved neighborhood that will be used to acknowledge concerns regarding exposures to an environmental hazard.

State and local health departments have built cohesive and integrated surveillance systems designed to allow local response in identifying vulnerable populations, timely and focused outreach, and delivering efficient and effective public health. Because of a renewed strategic focus on data to action, Tracking Program grantees are reporting numerous PHAs that reveal utility in the CDC's Tracking public health surveillance platform beyond the traditional sense. Overall, PHAs serve as a major indication of how Tracking data, the Tracking Network, and Tracking partners all contribute to community-level public health protection.

Conclusion

Fundamental to the practice of surveillance is a clearly defined purpose that results in actionable public knowledge.[21] The CDC's Tracking Program and its grantees recognize the importance of providing information and data to their communities so that PHAs can guide improved health. Before the existence of the CDC's Tracking Network, Pew findings highlighted the lack of networking and communication systems, lack of collaborating partnerships, inadequate training and personnel resources, and the inconsistent quality of data that inhibited its use.[1] The case studies described in this article help illustrate that the Tracking Program has developed into a key resource that has enabled Tracking grantees to be responsive to a diversity of environmental health concerns.

The 3 presented case studies also show the value of the CDC's Tracking Network data when comparing environmental hazards and exposures to a wide range of health outcomes at the local level. Tracking Program grantees are able to transform environmental and health data into formats that are accessible to a broader audience by providing maps, charts, and tables and displaying where and when environmental health problems are happening in their community to guide state and local PHAs. The CDC's Tracking Network links environmental and public health information for state and local partners to drive forward-looking programs and PHAs that protect and improve the health of communities nationwide.

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Implications for Policy & Practice

In a time of competing priorities and limited funding, PHAs can serve as a powerful tool to advance environmental public health practice in a variety of ways:

- State and local environmental health professionals can learn from PHAs and employ similar approaches to better serve their community.
- PHAs can be a compelling and reliable source of information for public health practitioners, policy makers, and others interested in improving health outcomes for their constituents.
- Tracking grantees can measure the effects of their program activities at achieving desired short- and long-term outcomes by regularly identifying, collecting, and evaluating PHAs.
- PHAs may be shared with target audiences, promoting the Tracking Network's success and growth.

By examining PHAs using this approach, the Tracking Program can also identify strategies to improve program performance. PHAs may offer relevant information and context to improve the allocation of resources, enhance organizational capacity, or explore conditions causing public health problems. PHAs often highlight cross-sector collaboration, helping keep environmental health a priority at the state, local, and federal levels.

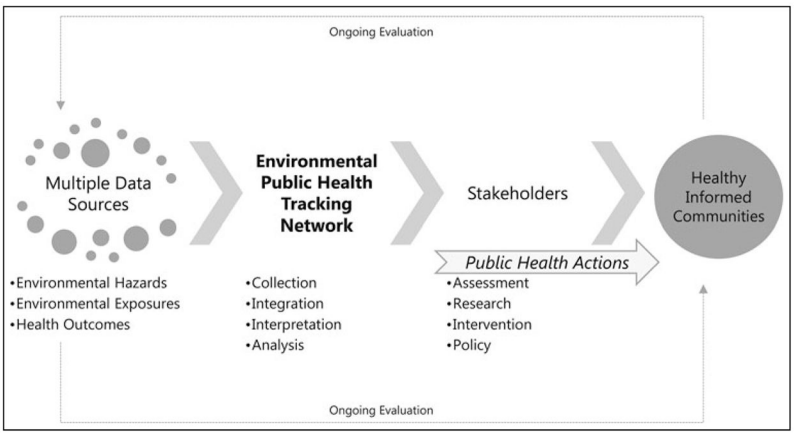

FIGURE 1.

Conceptual Diagram of CDC Tracking Network's Framework[a]

Abbreviation: Centers for Disease Control and Prevention.

[a]Shana Eatman. Adapted from the CDC's Environmental Public Health Tracking Program.

FIGURE 2.

Examples of PHAs From CDC's Tracking Grantees[a]

Abbreviations: Centers for Disease Control and Prevention; PHA, public health action.

[a]Shana Eatman. Information from the CDC's Environmental Public Health Tracking Program.

TABLE

Summary Table of CDC Tracking Grantee PHAs by Fiscal Year, Data Source, and PHA Component[a]

Grantee PHA	Fiscal Year Reported	Data Fields Used	Tracking Component(s) That Contribute to Public Health Impact
Radon data included on the Utah "Buyer Due Diligence" Checklist	2015	Radon data	Informing legislators, policy makers, communities, and individuals regarding potential environmental risks; guiding intervention and prevention strategies; informing the public about health and the environment
Analysis of cancer data to address community concerns at landfill site in Kentucky	2015	Cancer data including bladder, brain, esophageal, kidney, larynx, liver, leukemia, and non–Hodgkin lymphoma cancer; air toxins data including benzene and formaldehyde; population and socioeconomic data	Guiding intervention and prevention strategies; establishing the relationship between environmental hazards and disease (hypothesis generating); identifying, reducing, and preventing harmful environmental risks; informing the public about health and the environment; informing legislators, policy makers, communities, and individuals regarding potential environmental health risks
Mapping demographic variables for Zika virus in Florida	2016	Demographic data including % of population below poverty line, % nonwhite,% women of childbearing age, % speaking a language other than English at home	Identifying populations at risk; responding to outbreaks, disease clusters, and emerging threats; guiding intervention and prevention strategies

Abbreviations: Centers for Disease Control and Prevention; PHA, public health action.

[a]PHA information retrieved from multiple CDC Environmental Public Health Tracking Program Public Health Action Reports (PHAR) submitted by Tracking Program grantees.